Gu Test: A Progressive Measurement Of Generic Artificial Intelligence

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Technological Singularity is baseless. Turing Test and other empirical tests are invalid. Driverless cars without specific constrains (i.e. SAE level 5 automated driving) are impossible.

To verify these, we need design scientific experiments with strictly controlled conditions to test the underlying principles. Scientific conclusions can only be derived from these principles based on the conditions, which is not possible in empirical tests.

Turing test, the Go games played by AlphaGo Zero and AlphaGo Master, and the road tests of automated-driving cars, are just empirical tests, not scientific experiments.

In this paper,I will analysis the differences between scientific experiments and empirical tests, and some systematic problems in the popular textbook Artificial Intelligence: A Modern Approach. Then I will discuss the foundation of intelligence sciences, and propose Gu Test, a progressive measurement of generic artificial intelligence, to gradually develop scientific intelligence theories.

1. Scientific Experiments v.s. Empirical Tests

The recent accidents of automated-driving cars (some are fatal) raise some serious issues in artificial intelligence (AI) theories and testing [1].

According to the Waymo Safety Report 2017, their driverless cars are wired with certain pre-information [2], making it difficult to adapt to some future mode evolutions, especially when the mode evolutions are unstable.

If the mode evolutions are not stable, not only the judgement based on intuition could be wrong, the statistical results, the deep-learning of empirical data, and other AI technologies also could be severely misleading.

It is difficult, most likely impossible, to study the unstable mode evolutions in future based on intuition, or empirical tests .

Scientific experiments should be designed based the analyses of underlying principles and theories, thus to verify them. Such principles and theories could provide some insights into the unstable mode evolutions in future, which empirical tests are blind to.

Scientific experiments should also be done under strictly controlled conditions. Conclusions can only be derived based on conditions. Without such strictly controlled conditions, the results of simulations and empirical tests could be misleading.

Currently, we still have very little knowledge about human specific intelligence, and very little knowledge about the principles and theories of human specific intelligence. So it is still difficult to design scientific experiments with driverless cars.

However, we could select certain simpler systems, such as computer Go game systems, to experiment the technologies and principles available to these simpler systems.

The AlphaGo Zero paper on Nature presented a method learning from scratch. It claimed a superhuman performance [3]. However the paper supplied no evidence for this claim [4]. If some experiments could falsify the claim, they could reveal certain important principles we do not know yet, which might help to study other AI applications more complex, such as driverless cars, etc.

So I designed some experiment schemes with strictly controlled conditions to test this claim or any such implications, and to measure the intelligence in AI technologies progressively.

Regular people may spend many years before triggering destructive mode evolutions in AI applications such as driverless cars. Such mode evolutions could only happen in large-scale usages. Once triggered, such mode evolutions could happen frequently later [5].

So studying simpler experiments such as computer Go game systems could help to avoid large scale disasters. Also, it is much easier to isolate various factors and figure out the principles in such simpler experiments.

Go gaming is strictly defined within a very small space. Industrial

automations are typically designed in well controlled environments, but not strictly defined. Car driving is regulated, but the environment is not well controlled.

To design scientific experiments with AI, first we need clarify certain confusions.

2. The Problems in AI: A Modern Approach

There are problems in both philosophical foundations and test theories in the 3rd edition of popular textbook AI: A Modern Approach.

The 3rd edition deleted the introduction of Socrates and Plato in the Philosophy section of The Foundations of Artificial Intelligence presented in the earlier edition without paying attention to that Galileo actually set Socratic method and experiments as the foundation of sciences in his book Dialogue Concerning the Two Chief World Systems.

The 3rd edition took Aristotle philosophy as the rational mind by mistake: "Aristotle... was the first to formulate a precise set of laws governing the rational part of the mind."(page 5)

In Dialogue Concerning the Two Chief World Systems, Galileo actually indicated that Aristotle philosophy is not rational in sciences.

Immanuel Kant studied epistemology and critique. His studies indicated that Aristotle philosophy even cannot explain the rationale in philosophy.

Gödel's theorems showed the problems of logic. Gödel's studies indicated Aristotle philosophy cannot completely express the rationale in mathematics.

Aristotle philosophy cannot express the rationale in philosophy, mathematics, and sciences. So it could not "formulate a precise set of laws governing the rational part of the mind".

Logic is actually a primeval method in philosophy, which could detect certain problems in languages. Aristotle developed logic to prevent sophistry. However, the new studies in 20th century discovered that there are problems in logic itself, which could not really clear sophism, and could even cause other problems.

AI and artificial neural networks, including ResNet and its variant, Generative Adversarial Networks, Capsule networks, etc., could not get rid of the main problems of Aristotle philosophy at many key points in their flow processes.

The textbook does not distinguish the difference between empirical tests (such as Turing Test) and scientific experiments. It actually use empirical tests to test AI technologies, which could mislead the development of AI and intelligence theories, as explained.

Turing Test is also subjective, and the language complexity is much less than the human intelligence complexity. It also could not apply to many important AI applications, such as computer Go systems, driverless cars, etc.

To design good experiments, is to figure out some critical points in experimental spaces, so that new theories could be established based on small amount of experiment results, and other possibilities could be falsified, which is contrary to big data technologies. Big data technologies also could not analysis unstable mode evolutions in future.

Due to the problems mentioned, we need better understand how to develop scientific concepts, principles, and theories in intelligence studies, and design better experiments with them.

3. The Foundation of Intelligence Sciences

Intelligence sciences are to develop scientific concepts, principles, and theories of intelligence (especially human specific intelligence) based on experiments and other scientific methods.

Sciences originated from philosophies and introduced mathematics gradually. Scientific philosophies could not only provide insights and conjectures for theories and experiments, but also assure the validity of experiment results and the correctness of result interpretation.

To figure out the critical points in experiment spaces, we need better languages to describe and distinguish them, including new concepts of natural languages and new mathematics forms.

Gödel theorems suggest mathematics cannot judge the correctness in

sciences. Turing Machine has limitations. Universal approximation does not exist on Turing Machine. Computers, including quantum computers, have systematic problems to process high-order logic and recognize sophism. So intelligence sciences are different from mathematics and computer engineering.

Progresses from neurosciences are mainly at physiological level or animal level, such as in vision, audio, motion, emotion, etc. Nothing could illustrate the human specific intelligence so far. Life develops over the entropy law. Intelligence is quite different from energy. So intelligence sciences are also different from biology and physical sciences .

Intelligence sciences are new fields, requesting new concepts, principles and theories, etc. A good approach is to start with a cross studying of natural languages, philosophies, mathematics, and sciences. etc., which are typical human specific intelligence, with good principles.

Irrational numbers and the first mathematical crisis caused fundamental transition of human intelligence. Not far after that, sophism appeared as a destructive force to philosophy, and even to civilizations. The implications of these to human intelligence should be studied.

To develop these studies into sciences, we need design experiments with strictly-controlled conditions, to test various concepts, principles, and theories, etc.

4. Gu Test

Based on my studies, I design a procedure of progressive measurement of human specific intelligence based on falsifiability [6], to test AI technologies, to test my intelligence theories, also to illustrate the important issues and principles missed by current studies [7]:

1. A 4-dimension experiment space to test the intelligence of the strongest Computer Go system in Go games, especially to test AlphaGo Zero's superhuman claim or any such implications.

Since there is only one opportunity to gather certain important experiment results before computer Go systems could be adjusted by humans, the first round experiment should be done on the strongest Computer Go system with large-scale experiments.

2. Some experiment schemes for languages, to study the expressing power and limitations of various languages, including natural languages, mathematics, music, etc., and to study the personalities, intelligence, and mind mode transitions behind the language expressing.

For natural language processing (NLP), the studies include developing concepts, principles, theories, philosophies, etc., in natural languages, and also include processing high-order logic, recognizing sophism, verifying Chinese room, etc.

Although NLP could solve many problems, the remaining problems are critical problems which could mislead people and impede the development of human intelligence.

3. Some plans for brain studies and experiments. First, do a survey of current brain researches. Then develop certain experiment plans with some brain experts based on the survey and my theories. The experiments could be done by selected brain experts.

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These studies and experiments require certain amount of resources. They are all fundamental researches for peaceful purposes with no profit prospect.

They are scientific researches of the concepts, principles, theories, and philosophies of intelligence, rather than personal or social tactics or maneuvers, etc.

5. Future

The studies and experiments could be extended to other AI technologies and systems, and other aspects of human specific intelligence, in future.

However, my health condition is degrading very quickly, and life-threatening situations actually happened to me again and again. I cannot do further researches unless in safety personally and economically. Actually, some health degrading could be irreversible, so even for the experiment schemes already designed, I may not be able to keep memory of them for a long time.

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[1] According to news, in 2015 a blind man was allowed to take a driverless car alone, before the accident on 02/14/2016. Although the damage of this accident is minor, wrong judgement of driverless cars is very dangerous potentially.

https://www.washingtonpost.com/local/trafficandcommuting/blind-man-sets-out-alone-in-googles-driverless-car/2016/12/13/f523ef42-c13d-11e6-8422-eac61c0ef74d_story.html

https://www.marketwatch.com/story/google-says-driverless-cars-are-ready-to-make-money-but-we-wont-know-if-they-do-2016-12-13

[2] https://waymo.com/safety/

[3] https://www.nature.com/articles/nature24270

[4] Superhuman is a concept related to generic human. AlphaGo Zero defeating AlphoGo Master is not an evidence of superhuman. AlphoGo Master defeating some humans in some games is not an evidence of superier to generic human, either.

After the propagation of Technological Singularity and driverless cars from high-tech industries, such a superhuman claim could give a wrong impression that these AI technologies have already exceeded generic human intelligence.

My experiment schemes for computer Go systems introduced later in this paper is to verify that AlphaGo Zero does not have generic human intelligence even in Go game. Since Deepmind does not respond to my experiment requests, people could be more confused.

[5] Due to lack of understanding about intelligence principles and AI technology problems, both the definition and testing of SAE level 3 and 4 automated driving could be misleading. However, without resources for research, I only discuss level 5, which could be derived from my theories. My research plans start with simpler systems, such as computer Go, not driverless cars directly.

[6] Gu Test does not intend to distinguish humans from humans. It only measures the difference between generic human and machines, or between generic human and other animals.

[7] Sciences are different from mathematics. Mathematicians only can rely on peer review. However, sciences are based on Socratic method and experiments. Scientific methods are great enhancements to methematical methods for human intelligence.

Making scientific conclusions only based on logic could be misleading, because existing logic does not have enough expressing power for scientific phenomena. Some "logic errors" may not be real errors, but just misunderstanding. So scientific disputes should be solved by open discussions and experiments.

Sciences should always be open to new experiments, because new experiments could lead to new discoveries. And open discussions also could clarify some misunderstanding.

For issues related to my papers, people should not make conclusions without open discussions and without real scientific experiments.